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association latite, andesite, rhyolites and hypabyssal monzonite, syenite and granite. The trace elements analyze of these 2 series rocks show similar pattern with abundance of LILE and depleted HFS. The basic compositions of these series show negative of Rb and positive K, Nb and Zr anomaly. Shoshonite and latite contain Ba -1050-2000 ppm, the decrease of bimodal series 1300-1400 ppm. The REE pattern shows modern decrease from LREE to HREE. Although bimodal series volcanite show higher HREE than latite series. A moderate negative and slightly positive Eu anomaly is present for volcanite all series rocks. The La/Yb = 11.8-18.59 for bimodal series volcanite and La/Yb = 23.8-24.8 for shoshonite and latite. Sr87/Sr86 ratio of the basalt of bimodal series is 0.7067; of the latite of the shoshonite latite series is 0.7076. Radiogenic age of basalt of bimodal series is 105-120 m.a by method K-Ar and Rb-Sr. The shoshonite series volcanite are more ore potential. High and intermediate sulfidation epithermal mineralizations are known in Mongolia, following the shoshonite series volcanite. The high sulfidation epithermal gold mineralization are controlling by vuggy quartz and alteration mineral association. The quartz and carbonate veins with mineralization Pb-Zn-Ag(Au) are common for the intermediate sulfidation epithermal ores.

170-11 Poster Marzoli, Andrea

TIME-RELATED GEOCHEMICAL EVOLUTION OF CAMP BASALTIC VOLCANISM FROM MOROCCO

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Keywords: large igneous province; geochemistry; basalt; Triassic; Morocco

Eruption of Central Atlantic magmatic province (CAMP) basalts occurred at about 200 Ma on four continents and preceded the disruption of Pangea. Some of the best preserved CAMP flood volcanics outcrop on the central High Atlas, Morocco, where four volcanic units are recognized in several volcanic piles, with a total thickness up to 300m: the Lower, Intermediate, Upper and Recurrent tholeiites. The lower three units basalts were erupted in a short time span, as is suggested by their indistinguishable 40Ar/39Ar plateau ages (198.5 +/- 0.5 Ma). The major and trace element and isotopic composition of the lava piles display a clear time-related evolution. The Lower unit consists of up to 22 olivine-bearing basaltic andesite lava flows (SiO2 = 53.3-54.6 wt%, MgO = 6.7-9.4 wt%) with relatively high incompatible elements (e.g., TiO2 = 1.30-1.60 wt%, Nb = 11-13 ppm, chondrite-normalized La/Ybcn = 4.5-5.2) and 87Sr/86Sr (0.7058-0.7064 at 200Ma) and low 143Nd/144Nd (0.5123-0.5124). The Intermediate unit (about 10 basaltic andesite flows) and the Upper unit (2-5 basaltic flows) record progressively lower SiO2 (53.8-52.6 and 52.3-51.4 wt%, respectively), incompatible elements (e.g., TiO2 = 1.2-1.3 and 1.0-1.1 wt%, Nb = 6.3-9.9 and 5.0-5.2 ppm, La/Ybcn = 3.2-3.7 and 2.5-2.7, respectively) at similar MgO. Initial Sr isotopic compositions of Intermediate and Upper basalts decrease slightly (0.7062-0.7057 and 0.7055-0.7056) at similar 143Nd/144Nd. Finally, the Recurrent lava flows have evolved basaltic composition (MgO = 5.6-6.8 wt%) with high TiO2 (1.5-1.6 wt%), low incompatible element contents (e.g., Nb = 5.1-5.2 ppm), almost flat REE patterns (La/Ybcn = 1.3-1.4), and relatively high initial 143Nd/144Nd (0.5123-0.5125). The distinct major and trace element and isotopic compositions of the four units and the discrete compositional jumps between the basalts of successive units can not be attributed to low-pressure differentiation (e.g., fractional crystallization +/- crustal assimilation), but require distinct parental magmas generated from a progressively depleted mantle source. The geochemical shifts among lava flow units are associated with shifts of paleomagnetic directions which record secular variations, as established by the magnetostratigraphy of the volcanic piles. Thus, CAMP basalts were erupted as brief pulses of geochemically distinct magma series.

170-12 Poster Weber, Bodo

THE IGNEOUS AND METAMORPHIC HISTORY OF THE CHIAPAS MASSIF, SE MEXICO: NEW INSIGHTS FROM ZIRCON GEOCHRONOLOGY BY SHRIMP AND TIMS ANALYSIS

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Keywords: Igneous; Metamorphic; Geochronology; Zircon; Mexico

The Chiapas Massif (CM) in SE Mexico is one of the most voluminous plutonic rock complexes in Mexico, covering an area of approximately 20,000 km² parallel to the Pacific coast of the State of Chiapas. Due to the apparent predominance of granitoid rocks, former workers defined the CM as "Chiapas Batholith" of Permo-Triassic age. Our study has shown that the history of the CM is a complex combination of magmatism, metamorphism, and ductile deformation. A sequence of intensively folded sedimentary rocks and granitoids have been deformed and metamorphosed at temperatures higher than 750°C and pressures about 5-6 kbars, causing partial anatexis. These rocks have been intruded by magmatites of compositions ranging from gabbro to granite and then, the CM was again affected by pervasive ductile deformation before uplift and cooling occurred during Triassic times. In order to elucidate the age of metamorphism, igneous protoliths, and its precursors we present U-Pb zircon ages on igneous and metamorphic rocks applying both, TIMS (Thermal Ionization Mass Spectrometry) and SHRIMP (Sensitive High Resolution Ion Microprobe) analysis. TIMS analysis yielded upper intercept ages around 1050 Ma (in average), indicating that the zircon cores of the orthogneisses were formed within a Grenville crust, known in Mexico as the Oaxaquia microcontinent. The lower intercept ages are mostly not well defined, ranging from ~240 to ~260 Ma. They represent an age mix of igneous and metamorphic zircon growth. By applying SHRIMP analysis on zircons from an anatectic gneiss we could distinguish between crystallization of magmatic zircon zonings at 271 ± 3 Ma and the age of metamorphic tips at 253 ± 4 Ma. The latter age corresponds to the time of high-grade metamorphism and it has been confirmed by dating metamorphic zircons from metasediments yielding 254 ± 3 Ma. Our results indicate that igneous activity in the CM is consistent with plutonic rocks of ages between 270 and 280 Ma in Mexico that are the result of late phase amalgamation of Gondwana along the Marathon-Ouachita suture to form Pangea. This event is followed by the evolution of a convergent margin and arc magmatism along the Pacific coast. High-grade metamorphism and deformation during the latest Permian is unique in southern Mexico and, hence, we consider the CM as being allochthonous with respect to the rest of Chiapas and the Yucatan peninsula better known as the Maya block.

170-13 Poster Guido, Diego

40AR/39AR GEOCHRONOLOGY ON THE EAST DESEADO MASSIF, CHON AIKE LIP, ARGENTINIAN PATAGONIA

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Keywords: Chon Aike LIP; Jurassic; Deseado Massif; Ar/Ar age; volcanism migration

The Chon Aike Large Igneous Province (LIP) comprises the Patagonia (North Patagonian and Deseado Massif geological provinces) and West Antarctica (Pankhurst et al., 1998). It is dominated by rhyolitic volcanic rocks, although minor andesites and basaltic andesites form a bimodal association. It is Jurassic in age and constitutes one of the largest silicic LIP known (235,000 km³). A regional WSW and S migration is proposed for the LIP volcanism in Patagonia (Pankhurst & Rapela, 1995; Féraud et al., 1999) and a local westward migration for the Deseado Massif province (Féraud et al., 1999; Bertrand et al., 1999; Pankhurst et al., 2000). The Deseado Massif acid volcanic rocks are middle to upper Jurassic, 177.8 ± 1.8 to 153.4 ± 0.3 Ma (Féraud et al., 1999; Pankhurst et al., 2000) and they conform the Bahía Laura Group. Volcanism in the region is characterized by extended pyroclastic facies mainly dominated by ignimbrites, magmatic facies as domes, porphyries and dikes and late reworked volcanic material. Five new 40Ar/39Ar plateau ages of the Bahía Laura Group from the eastern Deseado Massif were analyzed in the Centro de Pesquisas Geocronológicas from the Universidade de São Paulo. They were sampled from different volcanic facies, considering the stratigraphic relationship between them. Three different stratigraphic levels of rhyolitic ignimbrites were studied. The lower level, overlying pre-Jurassic rocks, arises 177.1 ± 1.6 Ma (biotite), the intermediate level results in 162.5 ± 1 Ma (sanidine) and the upper level has 156.5 ± 1.3 Ma (sanidine). The rhyolitic magmatic facies results in 164.4 ± 0.3 Ma (sanidine) for a porphyry and 163.7 ± 0.5 Ma (sanidine) for a flow dome. These two similar ages reflects a concentration by the end of the Cretaceous for magmatic activity in the area. The ages obtained in the east outcrops are in agreement with the known age range for the whole Deseado Massif province, suggesting that acid volcanism (Bahía Laura Group) have had a regional development during middle to upper Jurassic times. Consequently, in the eastern Deseado Massif it is not clear the proposed westward volcanic migration. Considering the ages and the high proportion of pre-Jurassic rocks outcropping in the east, the tendency to obtain younger ages to the west is interpreted to be consequence of a deeper structural level of exposure in the eastern Deseado Massif.

170-14 Poster Self, Stephen

VOLATILE EMISSIONS FROM SUBAERIAL LIPS

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Keywords: Flood basalts; Volatiles; Sulfur

The acme of subaerial LIP formation is distinguished from all other basaltic magmatism by the repeated effusion of huge batches of magma, ~ 103-104 km³ of lava per eruption in Columbia River Basalt (CRB) and Deccan provinces, over a short stretch of geologic time (characteristically << 1 Ma). Such a scenario does not appear to occur at any other times in Earth history. Vast pahoehoe-dominated lava flow fields are formed by activity on fissures 10s-100s of km long. Past work on CRB lava flows suggests that eruptions of this magnitude last in the order of a decade. Estimated mean eruption rates would have been 103-104 m³/s DRE, or 3x10⁷-1x10⁸ kg/s. To put this into perspective, about 10 years of activity at the AD1783 Laki peak eruption rate (1.2 x 10⁷ kg/s) would produce a lava flow field of flood basalt dimensions. Mass eruption rates would vary depending on the duration of effusion and the length of active fissure at any one time; ~3.5x 10³ kg/s/m (m = meter length of fissure) for a 2-km-long active fissure, down to ~100 kg/s/m for a 75-km-long active fissure. The occurrence of deposits of spatter, spatter-fed lava, and scoria mounds along eruptive fissures suggest that there was violent fire fountaining during flood basalt eruptions. Calculations show that fountain heights during periods of peak output may have exceeded 1.5 km for magma volatile contents of 1-1.5 wt%. Model estimates for the convective plumes rising above the fountains indicate heights in excess of 15 km. Based on a Laki analog and determination of volatile contents of flood basalt lavas, we estimate that ~70% of the volatiles were released at the vents and then lofted to upper tropospheric - lower stratospheric heights by the eruption columns. Analyses of CRB and Deccan lava flows indicate that individual flood basalt eruptions were capable of releasing >10,000 Mt of SO₂, which amounts to a loading of 1000 Mt per year for a 10-year-long event, a huge amount compared to even the largest historic releases such as Tambora 1815 (60-80 Mt). Thus, the atmospheric perturbations associated with SO₂ emissions from just one flood lava eruption were likely to have been of the magnitude predicted for a severe nuclear or volcanic winter, and would have lasted up to a decade or longer. Each LIP contains the record of 100s to 1000s of lava flow eruptions, many on the scale indicated above. The potential atmospheric impact of such large-scale, long-term degassing events is being investigated.

170-15 Poster Sinha, Jayant

SOURCE ROCK STUDY OF THE AMPHIBOLITES OF RANCHI SUB PLATEAU OF EASTERN INDIAN SHIELD, INDIA

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Keywords: ortho amphibolites; terrane; granoblastic; tholeiite

Ranchi sub plateau forms an important geological segment of the Chotanagpur terrane in the eastern Indian shield. The present work is aimed at a comparative petrogenetic study of the amphibolites occurring at different localities, viz. Ranchi, Chhuttapalu, Ormanjhi, Mesra, McCluskieganj, Lodhma and Bero in the Ranchi sub plateau. Here the amphibolites form a significant lithounit in the vast expanse of granitic rocks. Presence of amphibolite is indicative of a definite tectonism, sedimentation / basic magmatism and metamorphism in the area. The occurrence of amphibolite is not only helpful in the identification of pre-existing lithounit, but is also an indicator of the P-T conditions to which the source rocks were subjected to during the metamorphism. Geological modelling of the area reveals that granite and amphibolite form the major rock types, while the minor lithounits are represented by pelitic schists, quartzites and calc-silicate rocks. A careful field study indicates that amphibolites of two generations are found in the Ranchi sub plateau. Mineralogically both varieties of amphibolites are characterized by hornblende-plagioclase assemblage,